

Applicant CITY OF SEATTLE DEPARTMENT OF CONSTRUCTION AND LAND USE	Page of	Supersedes
	1 4	4-84
	Publication	Effective
	11/30/87	2/8/88
Subject Auger Cast-in-Place Piling	Code and Section Reference Section 306, Chapters 26 & 29, Seattle Building Code, Chapter 22-100 SMC	
	Type of Rule Review Criteria and Code Interpretation	
	Ordinance Authority	
	3.06.040	
Index Building Code/Technical Standards /Procedural Standards	Approved , <i>Holly Miller</i>	Date <i>2/2/88</i>

The purpose of this rule is to establish minimum requirements and procedures for auger cast-in-place piling which is a part of structural foundation systems, and to establish methods of verification of these requirements and procedures.

Description:

Auger cast-in-place piling are placed by rotating a continuous flight hollow shaft auger into the ground to a predetermined pile depth. High strength mortar is pumped with sufficient pressure as the auger is withdrawn to fill the hole preventing hole collapse and to cause the lateral penetration of the mortar into soft or porous zones of surrounding soil.

Design Requirements:

1. Design shall be in accordance with the provisions of Chapter 29 of the Seattle Building Code.
2. The pile capacity shall be determined by a Washington State Registered Civil Engineer who has experience in soil investigation and design (Geotechnical).

Exception: If the engineer or architect of record submits data from projects having similar soil conditions, and the loads are 10 tons or less (i.e. low hazard) the building official may waive this requirement.

3. The soils investigation report, by the Geotechnical Engineer, shall be submitted to the Department of Construction and Land Use (DCLU) for approval. The report shall contain soil boring logs, the results of tests performed, and the Geotechnical Engineer's analysis and recommendations.

AUGER GROUT

Design Mix - The grout mix design shall conform to the requirements of the Seattle Building Code, Chapter 26, and shall be submitted to the Engineer/Architect of Record, then to DCLU for approval prior to construction.

The consistency of the grout shall be checked by using the Corps of Engineers "Method of Test for Flow Grout Mixtures" CRD-C 611-80 (attached). The desired flow may be determined by tests run on the same mix on a previous project or may be determined by tests run in a laboratory trial mix. The inspector shall perform flow cone tests whenever any question regarding the consistency of the grout arises, or as directed by the design team or building official.

When the minimum sacks of cement per cubic yard of grout comply with the following specifications, batch plant inspection may be waived (see inspection requirements on next page).

12 sacks of cement per cubic yard for 5000 psi grout

10 sacks of cement per cubic yard of 4000 psi grout

9 sacks of cement per cubic yard for 3000 psi grout

Grout Tests - Grout tests shall be prepared and tested in accordance with ASTM Method C 109. Two-inch cube molds shall be provided with a top plate so designed as to restrain grout expansion and to prevent escape of water and grout.

Exception: Two-inch by four-inch cylinders may be used for non-restrained specimens when standard admixtures (not expansive or gas forming) such as water reducing admixtures conforming to ASTM C494 are specified.

A minimum of three sets of four cubes or cylinders shall be required for each days placement of grout or one set for each truck load of grout delivered, whichever is greater. One cube or cylinder shall be tested at 3 days, one at 7 days and two at 28 days.

Exception: The three-day test may be omitted when approved by the building official.

Contractural Submittals: The auger-pile contractor shall submit the following data for auger cast-in-place piles to the project engineer/architect and general contractor, with copies to DCLU, for review and approval prior to construction:

1. A record of the three most recent previous successful auger cast-in-place pile installation jobs.
2. The grout design mix.

3. Any proposed equipment to be used or piling installation procedures which deviate from those specified (including pressure gage and pump stroke counter).
4. Grout pump calibration data.

Special Inspection Requirements

1. Batch Plant Inspection - Continuous inspection of weighing and mixing grout by a registered special inspector in the batch plant.
2. Site Inspection - Continuous inspection of the grout placement shall be provided by a registered special inspector at the jobsite. The inspector shall:
 - a. Check the weights of all materials delivered as shown on the delivery ticket with those on the approved mix design.
 - b. Verify that the consistency of grout is in accordance with the mix design by the use of the flow cone and by visual inspection. Water may be added to increase the fluidity of the grout once within the first 15 minutes after the truck arrives at the jobsite, provided that the consistency of the grout does not exceed fluidity of mix design.
 - c. Keep written records of the amount of water added at the jobsite to each truck load of grout.
 - d. Cast samples for compression tests from each load of grout.
 - e. Inspect reinforcing steel for conformance with the DCLU approved plans and conformance with Seattle Building Code.
3. Pile Inspection - The installation of piling shall be continuously inspected by the Geotechnical Engineer who prepared the soils report, or by his representative. He shall verify that the piling has been installed to the depth and size specified, using the prescribed methods of installation.

Reports

1. Special Inspection - In addition to general information required on all quality control reports (i.e., job name and address, inspector's name and firm, location of items inspected, etc.) the report shall include: name of grout supplier, batch weights per cubic yard, total yardage placed, list of grout delivery trucks and amount of water added to each at the jobsite and results of any tests performed. Any change in the approved mix weights or materials shall be reported to DCLU immediately.
2. The Geotechnical Engineer shall submit the complete record of all auger cast-in-place concrete piles to DCLU for approval prior to placing pile caps. The record shall indicate the pile capacities, location, diameter, length, elevation of tip and top of each pile, volume of grout used in each pile, calculated volume of drilled hole and the ratio of volume of grout pumped to the calculated hole volume, the rate of withdrawal versus pump capacity, and any unusual conditions encountered during installation of piles.

(Issued 1 Dec. 1980)

C 611

CRD-C 611-80

TEST METHOD FOR FLOW OF GROUT MIXTURES
(Flow-Cone Method)

Scope

1. This method of test covers the procedure to be used both in the laboratory and in the field for determining the flow of grout mixtures by measuring the time of efflux of a specified volume of grout from a standardized flow cone.

Apparatus

2. (a) **Flow Cone.**- The flow cone shall conform to the dimensions and other requirements indicated in Fig. 1.

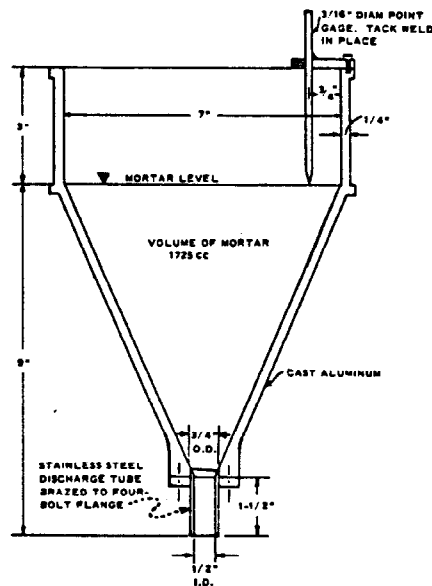


Fig. 1. Cross section of flow cone

SI Equivalents	
U. S. Customary, in.	SI, mm
3/16	5
1/4	7
1/2	13
3/4	20
1-1/2	38
3	76
7	177
9	228

(b) **Stop Watch.**- A stop watch having a least reading of not more than 0.2 sec.

Calibration of Apparatus

3. The flow cone shall be firmly mounted in such a manner that the top will be level and the cone free from vibration. The discharge tube shall be closed by placing the finger over the lower end. A quantity of water equal to 1725 ± 1 cc shall be introduced into the cone. The point gage shall be adjusted to indicate the level of the water surface.

Sample

4. The test sample shall consist of 1725 ± 1 cc of grout.

Procedure

5. Moisten the inside surface of the flow cone (Note 1). Place the finger over the outlet of the discharge tube. Introduce grout into the cone until the grout surface rises into contact with the point gage. Start the stop watch and remove the finger simultaneously. Stop the stop watch at the first break in the continuous flow of grout from the discharge tube when the cone is essentially empty (Note 2). The time indicated by the stop watch is the time of efflux of the grout. At least two tests shall be made for any grout mixture.

Note 1.- A recommended procedure for insuring that the interior of the cone is properly wetted is to fill the cone with water and, one minute before beginning to add the grout sample, allow the water to drain from the cone.

Note 2.- If there is a break in the continuity of discharge prior to essential emptying of the cone, the grout is too thick to be properly tested for flow by this method.

Report

6. The report shall include:

- Average time of efflux to the nearest 0.2 sec,
- Temperature of the sample at the time of test,
- Ambient temperature at the time of test,
- Composition of the sample, and
- Information on the physical characteristics of the sample.